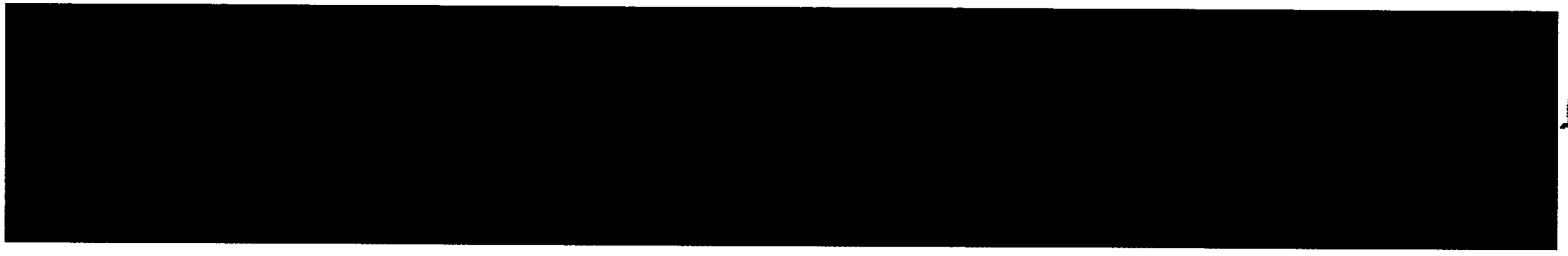


We study the formation and evolution of part of a solar system using a coagulation code and Fokker-Plank solver. The code calculates the growth of planets, like Earth, Jupiter, and Pluto, from the merger of much smaller objects.

We compare our results with observations of our and other solar systems to understand the origin of the planets and (eventually) the origin of life on earth and elsewhere.

Planets form in a thin disk of gas and dust around a young star. Newly-formed planets are too faint to detect with current telescopes, but the dust that accompanies planet formation is detectable.

In our calculations, we build images of the dust as planets grow larger. The amount of dust along the orbit of a planet is roughly proportional to the mass in the planet.

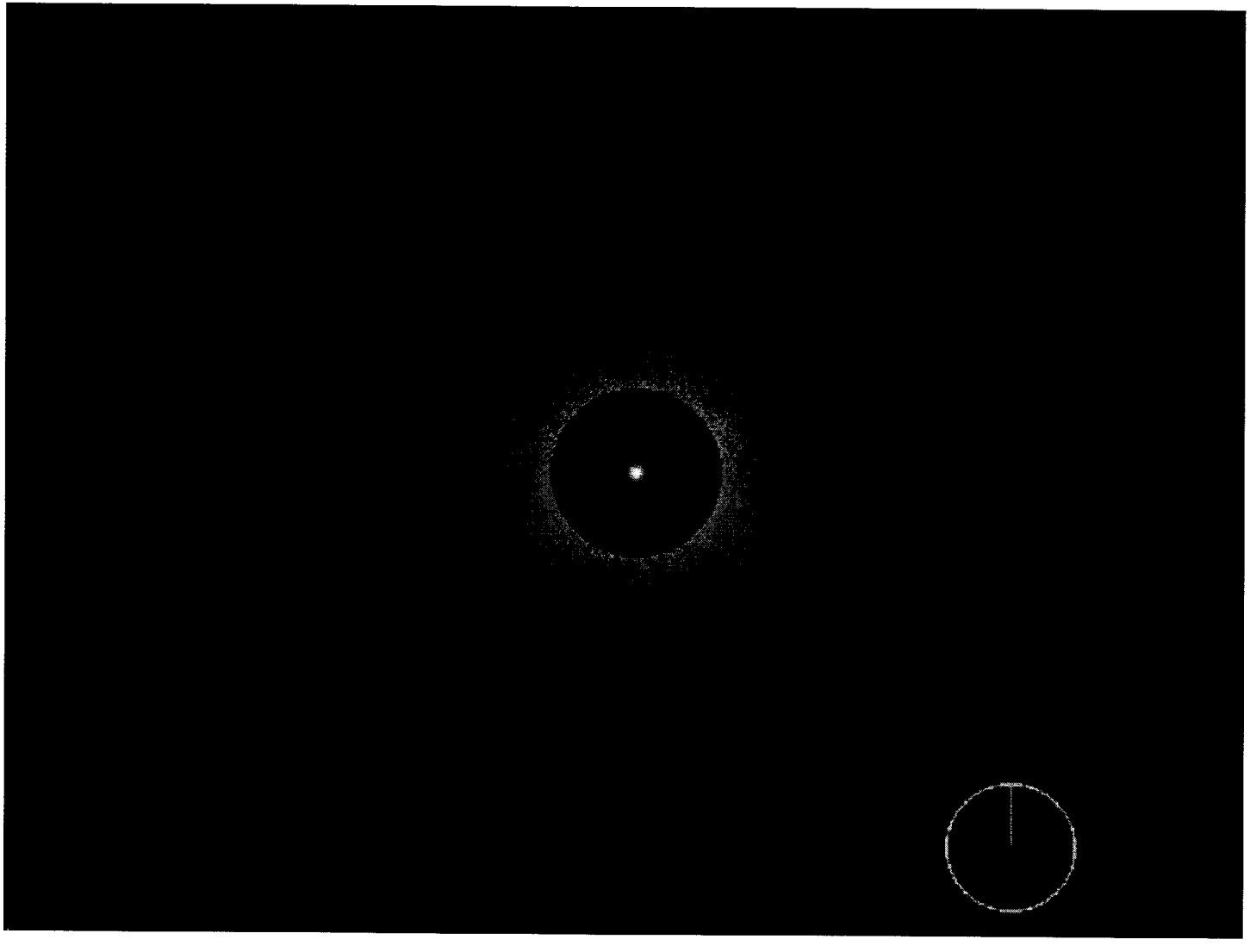
To compare our results with observations, we make movies of the images from each calculation. Every image in the movie represents about 100000 to 1000000 years of time.

This movie starts with the following initial conditions: roughly 10 billion billion planetesimals 1-100 m across embedded in a disk that extends rougly from the orbit of Neptune to the outer edge of the Kuiper belt in our solar system. The planetesimals collide, merge and grow in sizes of 10-100 km in only 1-3 Myr!

Once the largest planet has a radius of 1000 km, it begins to stir up smaller bodies nearby. These smaller bodies then begin to fragment (instead of merge) when they collide. Continued fragmentation of these small bodies produces a ring of dust, seen in the movie as a bright blue or yellow ring in a dull read or light yellow disk.

The movie shows the changing brightness of dust grains in the disk, ranging from dull red for the lowest intensity through yellow to bright blue or white for the highest intensity. The dynamic range in each frame is roughly a factor of 10000. The movie has a clock to indicate the time and lasts 2 Gyr, a little less than half the age of our solar system.

In this "weaker bodies" movie, particles are easier to fragment than stronger bodies, and so produse more dust and more (and brighter) rings when they collide.



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